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Report of the First Session

FAO EXPERT PANEL FOR THE FACILITATION OF TUNA RESEARCH

Rome, 8-12 June 1964

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 1964

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FIb/R13	(En)	Report of the FAO working party for rational utilization of tuna resources in the Atlantic ocean: first session, FAO, Rome, 25-30 October 1963	1963
FIb/R13	(Fr)	Rapport du groupe de travail FAO sur l'utilisation rationnelle des ressources thonières de l'océan Atlantique: première session, FAO, Rome, 25-30 octobre 1963	1963
FIb/R13	(Es)	Informe del grupo de trabajo de la FAO sobre aprovechamiento racional de los recursos atuneros del océano Atlántico: primer período de sesiones, FAO, Roma, 25-30 octubre 1963	1963
FIb/R14	(En)	Report of the first session of the advisory committee on marine resources research: 28 January - 2 February 1963	1963
FIb/R14	(Fr)	Rapport de la première session du comité consultatif de la recherche sur les ressources de la mer, Rome, 28 janvier - 2 février 1963	1963
FIb/R14	(Es)	Informe de la primera reunión del comité asesor sobre investigaciones de los recursos marinos, Roma, 28 enero - 2 febrero 1963	1963
FIe/R15		La industria pesquera en el Uruguay (distribución limitada)	1963
FIe/R16		Report to the Government of Saudi Arabia on the organization of fisheries operations on the Red Sea Coast	1964
FIt/R17	(En)	Report of the FAO fishing vessel stability meeting, Gdansk, Poland, 7-14 October 1963	1964
FIb/R18	(En)	Report of the first session of the FAO expert panel for the facilitation of tuna research, Rome, 8-12 June 1964	1964
FIb/R18	(Fr)	Rapport de la première session du groupe d'experts FAO chargé de faciliter la recherche sur le thon, Rome, 8-12 juin 1964	1964
FIb/R18	(Es)	Informe del primer período de sesiones del cuadro de expertos de la FAO para la facilitación de las investigaciones sobre el atún, Roma, 8-12 junio 1964	1964

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REPORT OF THE FIRST SESSION OF THE FAO EXPERT PANEL FOR THE FACILITATION OF TUNA RESEARCH

Rome, 8-12 June 1964

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, September 1964

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Members of the Expert Panel for the Facilitation of Tuna Research
Members of ACMRR
Participants and Observers at the FAO Working Party for Rational Utilization of Tuna Resources in the Atlantic Ocean
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Gives background information on the organization, terms of reference, composition, and procedures of the panel, agenda of the first session and conclusions and recommendations approved during the session. Appends a list of the members of the panel, participants at the first session and a list of working and information papers considered by the panel.
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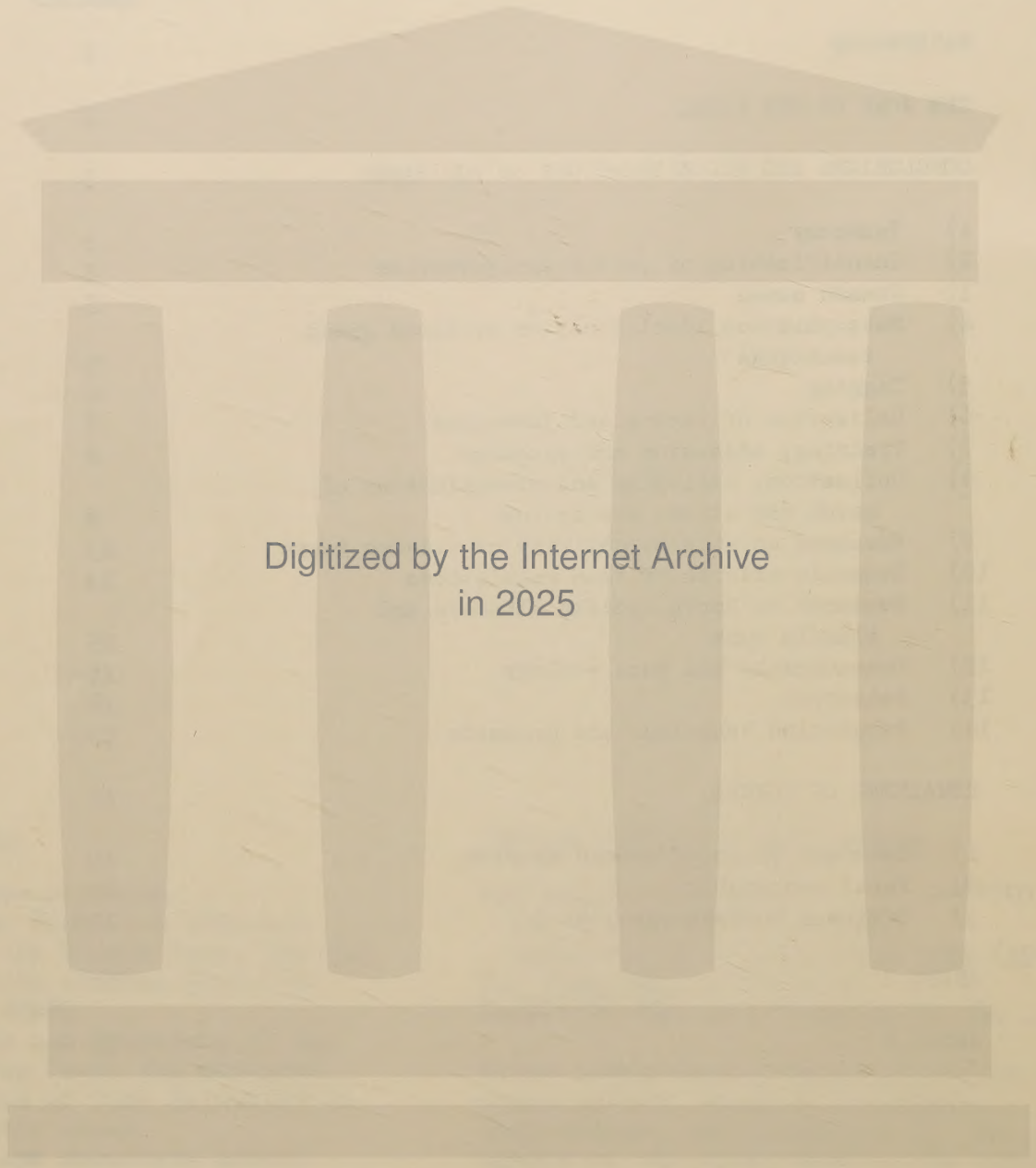

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I BACKGROUND

At the World Scientific Meeting on the Biology of Tunas and Related Species convened by the Food and Agriculture Organization of the United Nations (FAO) in La Jolla, California, U.S.A., 2-14 July 1962, a Resolution (No. 19) was adopted which reads:

"The Meeting,

Having considered the existing state of scientific knowledge and understanding concerning the biology of the tunas and related species on a world-wide basis;

Having taken into account the results of previous regional meetings concurrent with the biology of the species supporting these rapidly increasing fisheries, held in Dakar, Honolulu and Mandapam Camp;

Discerning the continuing need for increased liaison between scientists and laboratories conducting research on these subjects to the end of achieving better compatibility and completeness of data, uniformity of methodology, inter-calibration of instruments and exchange of information and workers between laboratories;

Being aware of the need for identifying critical problems and stimulating research on them, and where necessary, facilitating cooperation in their solution;

Being convinced that a continuing means should be provided to achieve these ends, particularly as expressed in the resolutions of this meeting;

Invites the Director-General of the Food and Agriculture Organization of the United Nations to take steps consistent with the constitutional responsibilities and powers of his Organization to promote implementation of the resolutions of this meeting, and

Suggests that he explore with Governments the desirability of setting up a special committee to facilitate the implementation of the resolutions of this Meeting. Such a committee should, in the view of the Meeting, be small (of about fifteen members) and composed of scientists who would act in their individual capacities.

Requests further that a Secretariat for the Committee be furnished by FAO which could assist the Chairman and the Committee, for instance, by acting as a central point of communication when needed and as a point of dissemination through appropriate channels of the results achieved by the Committee, and which would further take such steps, pursuant to recommendations of the Committee, as might be necessary to insure the effectiveness of the Committee's work." (FAO Fisheries Reports No. 6, Vol.1, pp. 17-18).

In accordance with this Resolution the Director-General of FAO established in 1963 a Continuing Committee for the Facilitation of Tuna Research[1/].

The terms of reference and composition established for the Panel, set forth in the above cited Resolution, and its procedures, are the following:

(i) Terms of Reference

(a) to resolve, through consultation, problems concerning the adoption of standard methods of measurement and collection of data and material; the development of uniform technical nomenclature; the intercalibration of instruments; the establishment of procedures for enabling scientific information collected by diverse groups of many different areas to be presented in compatible form for communication to, and study by, the scientific and fishing communities of the world; the movement of scientists between countries and institutions;

(b) to stimulate interest in the solution of urgent problems of international significance to the understanding of tuna resources in relation to the effects of fishing and to their environment;

(c) to mobilize the voluntary cooperation of persons, private and public institutions, state, intergovernmental and international organizations in joint endeavours in tuna research.

(ii) Composition

The Panel is composed of scientists appointed in their personal capacity by the Director-General of FAO. The Members are selected from the FAO Panel of Fisheries Experts on the basis of their expert knowledge, account being taken of the need for regional representation. (For List of Members see Annex 1)

(iii) Procedures

The Panel will work mainly by correspondence, but may eventually convene from time to time as occasion demands and as budgetary considerations permit. The Secretary, appointed by the Director-General from among the staff of the Organization, will provide a focus of communication and point of dissemination of proposals made and results achieved.

II THE WORK OF THE PANEL

The Panel convened at FAO Headquarters, Rome, 8-12 June 1964. Of its members Dr. A. G. Nicholls from Australia and Mr. J. C. Marr were absent. Mr. Marr, by per-

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1/ According to recommendations made by the Program Committee to the 40th Session of the FAO Council on Nomenclature of FAO bodies and gatherings, the name of the Committee was changed to FAO Expert Panel for the Facilitation of Tuna Research.

sonal request, was represented by Dr. L. M. Sprague. The Panel elected as Chairman Dr. M. B. Schaefer of the United States of America and as Vice-Chairman Dr. H. Nakamura of Japan. Mr. E. N. C. Eziuzo of Nigeria and Dr. L. M. Sprague of the United States of America were elected Rapporteurs.

The Panel invited to sit with it, as observers of the FAO Advisory Committee on Marine Resources Research, Dr. W. M. Chapman and Mr. D. L. McKernan of the United States of America.

The Panel adopted the following agenda.

1) Opening of the session.
2) Election of officers.
3) Establishment of Working Groups.
4) Program of work of Working Groups.
5) Approval of reports of Working Groups.
6) Approval of report of the Panel.
7) Date and place of second session.
8) Election of the officers for next session.
9) Other business.
10) Adjournment.

During plenary sessions of the Panel and meetings of its three Working Groups, appointed by the Chairman, the recommendations contained in the resolutions approved by the FAO World Scientific Meeting on the Biology of Tunas and Related Species were reviewed as well as the documentation prepared for the session by some of the members of the Panel and by the staff of the Fisheries Division of FAO.

A list of this background documentation is given in Annex 2. Information made available by some nations and institutions was also taken into account.

In the light of these reviews the Panel reached the conclusions and made the recommendations which follow.

III CONCLUSIONS AND RECOMMENDATIONS OF THE PANEL

1) Taxonomy

The Panel notes that Resolution 1 of the FAO World Scientific Meeting on the Biology of Tunas and Related Species[1/] has been implemented by the establishment of three centres for the taxonomic study of tuna specimens collected on a world-wide basis. The centres at the U.S. National Museum, Washington, D.C., the Muséum National d'Histoire Naturelle, Paris, and the Fisheries Department of Kyoto University, Japan are now operational.

1/ Hereafter referred to as the WTM.

The Panel recommends that FAO contact the directors of the museums, the FAO Regional Fishery Officers, Field Officers and other interested parties for the purpose of stimulating the collection of suitable material not now in the collections of the centres. The Panel strongly recommends that the selected centres be given additional financial support from their parent agencies to facilitate the expensive task of shipping and housing taxonomic collections, as well as for the purpose of facilitating the travel of taxonomic workers. Travel is essential both for workers wishing to visit such centres and for workers at the centres needing to examine a larger series of materials from other areas.

The Panel strongly recommends that a Working Group on Taxonomy be formed under the auspices of FAO, to include a representative from each of the taxonomic centres and such other persons as are recommended by the taxonomic centres and approved by FAO. The Working Group should, by correspondence, discuss fully the various problems now under consideration in various places and make a full report with specific recommendations to the chairman of the Panel.

The Panel agrees that a definitive monograph on the scombroids with all species illustrated in colour is badly needed and urges carrying out the completion of such a work as soon as possible. It also recommends that FAO, in consultation with the Working Group on Taxonomy, explore the feasibility of such study and report to the chairman of the Panel. The report of FAO should identify the need and magnitude of funds necessary to complete such a monograph. FAO should then explore ways in which funds can be made available for the completion and publication of such a definitive monograph on the taxonomy of scombroids.

The Panel regrets that the recommendation contained in Resolution 4 of the WTM dealing with the multi-disciplinary attack on taxonomic problems has not been effectively acted upon. The Panel requests the chairman to name Dr. Robert Gibbs of the U.S. National Museum to select two additional workers and form a Working Group charged with identifying by correspondence a suitable problem. The Panel believes that such a study could form a classical model of such an approach and recommends that such a study be undertaken at the earliest possible time.

The Panel notes that tuna workers in the North Atlantic have requested that such a multi-disciplinary approach be undertaken as a solution to the taxonomic problems of the Atlantic bluefin tuna. The Panel believes that bluefin tuna, Euthynnus including what is called Katsuwonus and bigeye tuna would be three obvious groups for which such a study could provide valuable information.

2) Identification of larvae and juveniles

The Panel notes that there is a discrepancy among the views of taxonomists in regard to the identification of certain tuna larvae. So far, identification of tuna larvae has rested on preserved specimens. Since there may well be intraspecific variations in the pigment patterns used for taxonomic purposes and the

spawning seasons and areas of different species are not discrete it is recommended that a specific technique be developed to raise fry on oceanographic research vessels to such a stage that their specific characteristics may be identified. The Panel commends the work of the Nankai Regional Fisheries Research Laboratory on its progress in this field and urges that this work be given high priority.

The Panel notes that new techniques for the identification of genetic characters (markers) are now available (Working Paper 7). In the Panel's opinion, these techniques would be suitable for research on the identification of tuna larvae and encourages workers at the Honolulu Biological Laboratory of the U.S. Bureau of Commercial Fisheries and the Nankai Regional Fisheries Research Laboratory to provide suitable material to workers interested in attempting to use these techniques.

3) Common names

The Panel recommends that uniform common names be adopted in all reports and scientific publications whenever there is need for such usage, and asks the Working Group on Taxonomy which is to be formed (see above), that at the same time that a list is provided of accepted names of species, it also propose a list of common names to accompany the scientific names.

4) Subpopulation identification by genetic techniques

In regard to Resolution 2 of the WTM, the Panel notes Working Paper 7, the report of the Tuna Blood Group Centre of the Honolulu Biological Laboratory.

The Panel calls attention to the fact that effective exchange of tuna blood group reagents has taken place between the three laboratories known to be working on the identification of tuna populations by means of genetic criteria. The three laboratories are located at the Biological Laboratory, Honolulu, the Inter American Tropical Tuna Commission, San Diego, California, and the Tokai Regional Fisheries Research Laboratory, Tokyo, Japan.

The Panel wishes to stress that additional genetic techniques, referred to in Working Paper 7, are now available for use in recognizing animal subpopulations. Further information is available from the Tuna Blood Group Centre, Honolulu Biological Laboratory.

The Panel calls attention to the need for a standardized set of collecting instructions for blood and serum specimens and requests that the Tuna Blood Group Centre of the Honolulu Biological Laboratory prepare such a set of instructions and requests that FAO publish and distribute the instructions to interested laboratories.

The Panel calls attention to the graduate programme in genetics of the University of Hawaii which offers a degree programme in Marine Immunogenetics and to the facilities which are available for training through the University of Hawaii in cooperation with the Honolulu Biological Laboratory, and its Tuna

Blood Group Centre, as well as at the Centre itself. The Panel also wishes to call attention to the graduate programmes in immunogenetics at the University of California, Santa Barbara, California.

The Panel stresses the need for additional trained workers in the use of genetic markers for tuna subpopulation research and encourages the financial support through all available means for young workers wishing to enter this field. In this regard, the Panel calls attention to the section of this report which deals with training scientists. It is urged that laboratories in various localities, other than the existing centres mentioned above, establish facilities for collection and typing of tuna blood samples.

The Panel takes note of the research plans of Japan for an extensive investigation of the tunas of the Atlantic Ocean and strongly recommends that suitable collections be made for the purpose of subpopulation analyses and that such collections be made available to the Tuna Blood Group Centre, Honolulu Biological Laboratory. The Tuna Blood Group Centre, is requested to provide such financial assistance as is necessary in connection with the handling and shipping of these specimens.

The Panel would like to identify the Gulf of Guinea as an area in which subpopulation studies of yellowfin tuna would provide valuable information, since it is believed that subpopulations both from the north and south Atlantic seasonally contribute to the tuna fisheries in that Gulf.

The Panel points out that attention needs to be given to techniques which will provide clarification and identification of potential mixtures of tunas from different subpopulations. Such techniques as tagging, more sophisticated genetic techniques, etc., should be given additional emphasis and in this connection there is a need to develop better mathematical models for application to these problems.

5) Tagging

The Panel notes that it would be desirable for tagging experiments to be conducted on an international basis. Tagging should be applied to all size groups, but these studies should include the sizes smaller than those taken in the commercial fishery.

The Panel recommends, in order of priority, that consideration be given to conducting international tagging experiments on yellowfin tuna, skipjack, bluefin tuna and albacore tuna. The Panel's intent is to draw attention to tagging programmes which should be conducted in all major fisheries. The Panel suggests that the chairman name a corresponding working group to exchange some definite suggestions in regard to this task and report to the chairman. The report should identify the facilities available as well as the magnitude of financial assistance needed effectively to implement such a study.

The Panel requests FAO to publish an illustrated review of the various kinds of tuna tags now in use. The Panel notes with pleasure that Mr. F. J. Mather of the Woods Hole Oceanographic Institution has agreed to prepare the review according to the material made available to him by FAO and other sources. The Panel further requests FAO to give wide distribution to information on current tagging programmes, to call the attention of its Regional Fishery Officers and Field Officers to these programmes, and to publicize as much as possible through these officers the nature of the tagging programmes in progress. The Panel further requests FAO to publish an annual inventory of tuna tagging programmes and to distribute this inventory to interested laboratories. The Panel requests all research organizations conducting tagging programmes to give maximum publicity to its programmes and to forward "promotional" material to FAO for suitable distribution. Being aware of the technical difficulties regarding the efficiency of different kinds of tags, the Panel recommends that further research be carried out in order to determine the efficiency of a variety of kinds of tags, particularly by agencies conducting tagging programmes such as Woods Hole Oceanographic Institution, the Biological Laboratory of the U.S. Bureau of Commercial Fisheries, San Diego, the Inter American Tropical Tuna Commission, the Nankai Regional Fisheries Research Laboratory, Kochi, Japan, as well as agencies that have facilities available for conducting experiments on live tuna of different species, such as the Honolulu Biological Laboratory.

6) Collection of larvae and juveniles

In regard to Resolutions 7, 8 and 9 of the WTM, the Panel notes that some technical progress has been made in developing and standardizing methods of collecting larval tunas and that since 1962, additional information exists which could be used to evaluate the merits of various collecting techniques. The Panel requests that the Honolulu Biological Laboratory form a working group, including the Nankai Regional Fisheries Research Laboratory and other interested parties, to act, by correspondence, to prepare the data available from the International Indian Ocean Expedition, and, with such additional information as is necessary, and in correspondence with the Working Group on Standardization of Zooplankton Sampling of the Scientific Committee on Oceanic Research (SCOR), the Zooplankton Sub-Committee of the International Council for the Exploration of the Sea (ICES), and the Panel on Biological Methods of the United States National Academy of Sciences Committee on Oceanography (NASCO), evaluate methodology and recommend a "standardized" gear to be used on forthcoming international oceanographic expeditions, as well as cruises contemplated in the near future off Chile, Peru and Ecuador and by the research vessels of other countries where appropriate.

The Panel notes that reference should be made to Recommendations 5 and 8 of the First and Second Sessions respectively of the FAO Advisory Committee on Marine Resources Research (ACMRR). The Panel concurs with the views expressed by the ACMRR in the above recommendations and urges that the laboratories working in this area be given greater financial support for the work related to plankton sampling and standardization problems.

The Panel notes that gear for collecting live larvae has been developed and used by the Nankai Regional Fisheries Research Laboratory. The Panel requests that FAO obtain further information regarding this technique and give it wide circulation to interested laboratories.

The Panel notes with interest studies which have as their objective the collection of juvenile tunas, and encourages that more extensive studies on collection of tuna juveniles be carried out and that where possible imaginative approaches to additional techniques of collection be instituted.

7) Training, education and exchange

The Panel recognizes the urgent need to encourage the research development of certain fields and the synthesis of others by means of exchanging scientists.

The Panel believes that certain fields of research should be identified by means of which the training of younger scientists could stimulate the establishment of additional laboratories competent to carry on certain kinds of work.

The Panel also believes that the synthesis of some fields would be greatly accelerated by bringing together senior scientists for the purpose of a detailed comparison of data and experience.

In addition, the Panel recommends that selected working groups be formed, composed both of senior scientists and younger scientists, to work together on selected problems for short periods of the order of one to three months.

In regard to the exchange of younger scientists, the Panel recommends that high priority be given to the exchange of young scientists in all fields relating to tuna research in order to provide a greater depth of experience.

Particular attention should be drawn to providing financial assistance from all available sources for the purpose of these training exchanges. FAO is specifically requested to support by providing monetary contributions where possible, by providing supporting documents to other funding agencies, by providing the potential recipient with information on sources of funds, and by providing other assistance of similar nature where necessary.

The Panel recommends that once training is completed in a particular discipline that all possible assistance be given to the trainee to continue the subject field in his working environment. Particular attention should be given by parent agencies to the budgetary requirements for such investigations and field support required by certain disciplines prior to training. In the Panel's opinion, training should not be initiated unless there is a reasonable probability of supporting the trainee's work subsequent to the completion of training.

In regard to the exchanges of senior scientists, the Panel recommends that high priority be given to the exchange of scientists in the fields of population structure and subpopulation identification by genetic techniques; interpretation of tagging results; population dynamics; population ecology; and taxonomy. In the case of senior scientists desiring to participate in such exchanges, the Panel urges that their parent institutions and governments facilitate by all possible means the accomplishment of the exchange, particularly by releasing them from their duties for the period of the exchange.

In regard to the formation of working groups intensively to study selected subjects for short periods of about one to three months, the Panel recommends that high priority be given to the formation of such groups for the study of subpopulation identification, taxonomy of larval tunas, and the taxonomy of adults. Because of the importance of establishing additional collecting centres and to provide standardization of reagents, intercomparison of techniques and materials, the Panel requests the Tuna Blood Group Centre of the Honolulu Biological Laboratory to organize a subpopulation identification workshop in the summer of 1965 and to provide funds for this purpose if possible.

Financial support for this general purpose is encouraged by the Panel. Such working groups should be supported by funds drawn from a variety of sources.

The Panel requests assistance from FAO in providing and/or identifying sources of funds and in publishing in suitable form the results of the group study and in publishing such other reports as may be appropriate to the work.

The Panel requests that FAO act to identify the opportunities for exchange training in reference to the fields and categories identified above, and as well to identify opportunities for "at sea" training on board research vessels.

Where the Panel has particularly identified certain critical fields for exchange and training, it recognizes that exchange and training opportunities are required throughout the range of disciplines applicable to tuna research and encourages all such exchanges and training whenever appropriate.

8) Collection, collation and dissemination of catch and effort statistics

The Panel reviewed the recommendations of Resolution 6 and the Report of Section 7 of the WTM, and also reviewed the documentation for the present meeting prepared by the Fisheries Division of FAO. It further took into account the information available on present and proposed procedures by various nations and institutions including in particular the recently published first issue of the Japanese report on the world-wide Japanese long-line tuna fishery.[1/] In the light of these reviews the Panel made the comments and recommendations which follow.

1/ Japan. Fisheries Agency. Research Division, Statistical survey report 1964 on tuna longline fisheries by fishing grounds, April-September 1962. Tokyo, Fisheries Agency, 103 p.

Total catch

The Panel recommends that records should, as far as possible, be compiled by weight of total catch of each species of tuna by month of capture, by geographical areas of 5° latitude and longitude, the boundaries of such areas being the latitude and longitude lines divisible by 5.

It is believed that most of the existing areal divisions employed by various Governments and Commissions will be compatible with this system; however, where statistical systems already exist, where the areal division are not compatible with the basic division into 5° areas, the data should be compiled by areas of 1° latitude and longitude so that they may be re-combined into the 5° system as well as into the system used by the agency in question.

For catches where the 5° area is unknown and cannot be estimated from auxiliary information, the quantity should be recorded as of unknown origin, but the general oceanic region of origin should be indicated. It is believed that these quantities will be very small.

The units of weight should be the weight of un-butchered fish (also often called "round weight" or "live weight"). Where the catches are logged or recorded in other units it will be necessary to obtain, by sampling, conversion factors to convert to un-butchered weight. One such instance is the Japanese long-line fishery where catches are logged by numbers of fish. In this case, it is suggested that the catch be reported in numbers of fish, but also in weight of fish using the best available information on average weight by time and geographical strata. Another instance is where fish are recorded by weight, but with organs such as gills and guts removed. In such cases there need to be obtained appropriate conversion factors.

Preliminary reports of catches should be distributed by each agency or nation to other interested nations or organizations at quarterly intervals if possible and, if not, at semi-annual intervals. FAO is requested to develop a distribution list for such reports. Subsequently, after receiving corrections on such preliminary reports FAO should compile and publish, on an annual basis, the summarised data.

Catch and effort data

In order to obtain information on changes in the apparent abundance of various tuna stocks, it is necessary to obtain information from at least representative samples of the fishing fleets by log books, interviews or other equivalent means, indicating the geographic area, the amount of effort expended and the corresponding catch.

Such records should be reported by geographical areas of 5°, the same as those indicated above for total catch. It will be desirable, where possible, for regional records to be compiled by 1° areas, but for the purposes of inter-

national reporting, 5° areas seem to be the most reasonable. Interchange of the more detailed information by 1° areas can be accomplished by laboratory to laboratory cooperation, where required.

Data for each species and each geographical area should be compiled and reported by gear type, and for each gear type by vessel size or other characteristics associated with fishing power. Where methods have been developed to standardize data from vessels of different size, they may be reported in standardized units, rather than by each vessel size, but in this event, the method of standardization used should be indicated.

Such data should be collected from representative samples for those kinds of gear which are of major importance for a given species in a given area. It is desirable to collect the data for more than one kind of gear where more than one kind is of major significance.

The principle kinds of gear used in the tuna fisheries are:

i. Long-line.
ii. Purse seine.
iii. Live bait - pole and hook.
iv. Trolled lures.
v. Traps.

It is believed that the most suitable effort units for the foregoing types of gear are:

Long-line - number of hook days.
Purse seine, live bait and trolled lures - the day's fishing is the most suitable statistic, but where that is not available the day's absence from port.
Traps - traps are of importance only in fisheries in the Bay of Spain and the Mediterranean. For this type of gear it appears best to compile the catch and total days fished, by months, for each trap individually, since it will probably be necessary to compare each trap with itself to determine changes in fish abundance.

In developing suitable categories of vessel size or other characteristics related to fishing power, the number and kind of categories should in the first instance be established by the scientists collecting the data. Undisputable standard categories should, in the future, be established, although this does not appear possible at this time.

Preliminary reports of catch and effort data should be distributed directly by the collecting agencies in the same manner as the reports on total catch referred to above. Final compilations should be made by FAO and distributed at annual intervals. In developing the system for tabulating and reporting these data, it will be desirable for the staff of FAO to consult various laboratories and members of the Panel. Such consultations will also be desirable in relation

to FAO's responsibility for assisting nations which require help in developing their methods of recording and reporting data.

It is suggested that the staff of FAO may wish to obtain samples of log books and statistical forms presently being used by various agencies, as a basis for designing systems suitable in other places.

The Fisheries Division of FAO, which is being strengthened in the field of stock assessment work, should be helpful also in assisting with the design of such collection and reporting systems, and with analyses of data.

Size composition sampling

Together with the collection of statistics on total catch, and catch and effort, it is desirable, and in some cases necessary, to collect samples of size composition in order to provide conversion factors, as noted above. Such samples are also valuable for assessing changes in the size composition of the stocks. Scientists should therefore be encouraged to obtain samples of the length frequencies of tuna catches from various areas and seasons, and to determine the length-weight relationships. So far as possible, it will be desirable to classify the length-frequencies by 5° areas, but other geographical strata will also be useful where this is not possible. Such length frequency samples (for which fork length, measured by caliper, should be used)[1/] may be obtained from landings of commercial vessels and from samples taken by exploratory and research vessels.

In order to obtain representative length frequency samples of tuna stocks it is desirable to take numerous individual samples each consisting usually of 100 fish or less from many different schools or catches, in order to average out the effect of schooling by size. It is desirable that studies be conducted similar to those done by the Inter American Tropical Tuna Commission, to determine optimum sampling designs for particular species and areas.

It is believed that it would be premature at this time to attempt to establish any centralized data exchange system for size frequency information. In the immediate future, such exchanges should be accomplished directly between laboratories, but a more centralized system may become desirable in the future. It is particularly important that exchange of information take place where several different nations are fishing on the same fish populations.

In addition to size frequency samples taken by scientific workers, records of size composition by commercial size categories are also useful, one example is the data of the trap fishery of the Mediterranean and its approaches and another example is the commercial size categories (basket counts) in the California canning industry. Such data should be compiled by individual laboratories and exchanged on a laboratory to laboratory basis.

1/ If measured by other means, measurements should be converted to the equivalent of measurement by caliper.

Processing data

In compiling and publishing information as indicated above, FAO will undoubtedly find it useful to employ modern methods, using electrical accounting machinery, or other high speed digital computers, with automatic high speed print out. Such equipment makes possible the rapid and cheap processing of large quantities of such information, and also provides print outs which may be directly duplicated by photo-offset processes, eliminating much hand work and consequent possibility of error. The staff of FAO may find it useful to consult with members of the Panel and with other specialists having expert knowledge of the application of such techniques to fisheries data.

9) Research on size selectivity of fishing gears

The fundamental technique of conducting research on size selectivity of fishing gear is to compare the size composition of catches of different kinds of gears, fishing in the same places at the same times. Specification of time and area strata into which data may be summarized and still be comparable cannot be given in advance, but needs to be studied in each instance.

This type of research should primarily be conducted by individual laboratories obtaining data from commercial fishing vessels and from research and exploratory fishing vessels. However, where two or more nations are fishing on the same tuna stocks with different gears, it is important that the concerned scientists exchange size frequency data generated by catches of different gear types, to assist in each other's research. At the present time it was thought that such exchanges should be on a laboratory to laboratory basis, and that it will be most desirable that the data be categorized by very fine time and area strata if they are to be most useful.

It may be desirable at some future date to establish a centralized reporting system for reporting such research, but this is at present premature.

10) Economic effects of tuna regulations

The Panel carefully considered the recommendations of Resolution 16 of the WTM and took account of the results of recent studies on fisheries economics and the opinions of the staff of FAO respecting this matter. It was thought that the objectives of Resolution 16 need to be approached step-wise as follows:

First there need to be undertaken pilot studies of comparative production costs in selected tuna fisheries, operating over large areas and employing a variety of techniques. For example, such studies may be undertaken in California by the United States Bureau of Commercial Fisheries or by a suitable non-governmental institution such as the University of California. In Japan such studies might be undertaken by the Tuna Fishermen's Association in collaboration with qualified economists from such institutions as Hitotsubashi University. We believe that to conduct these pilot studies adequately will require about three years.

At the same time as these pilot studies are being carried out, it will be desirable for FAO to begin to obtain some information of broad market trends by compiling data on prices and volumes of raw material in the world market, by general areas.

It will be desirable at the same time for FAO to improve and augment certain data series which it now compiles, and to initiate the compilation of new series for some sorts of data which will be important for evaluating the economics of the tuna fishery. These would include, for example:

Fleets of fishing vessels by size and type of gear; and traps.
Percentage of time of different kinds of vessels allocated to tuna fishing.
Prices of fish, as landed.
Amounts used for different purposes.
Output of processed commodities.
Value of products at wholesale and retail levels. (These data will only be of utility if the actual prices can be determined rather than posted prices, which may bear little relationship to the actual prices).

Following the completion of the foregoing, it may then be useful to discuss the establishment of a uniform statistical system, as envisaged by paragraph 2 of the recommendations of Resolution 16 of the WTM, by means of an international meeting or by a series of consultations.

At such time as a useful body of information has been developed, from which may be calculated cost per unit of output and value per unit of output as well as total value of catch, in some tuna fisheries, for a variety of techniques and levels of fishing effort a joint meeting of experts in fisheries dynamics and experts in fishery economics would be appropriate to commence consideration of the effects of alternative conservation measures on economic efficiency of the tuna industries, on a broad basis. It is not possible to forecast when such a meeting might be in order, but we do not believe it will be before the completion of the preliminary work, requiring at least three years, referred to above.

However, economic studies of effects of alternative regulations on economics of the tuna industries in some limited regions may be obtained from the pilot studies recommended above, and through other particular investigations undertaken by individual commissions, government laboratories or other agencies.

The Panel recognizes that for a complete solution of the problem of optimum allocation of means of production in the tuna fishery, it will eventually be necessary to conduct detailed marketing studies, from which price-demand functions for products at the consumer level may be generated. It was thought however, that such studies are most difficult and, while they should be encouraged, they should not supersede the more vital investigations discussed in the foregoing. Useful understanding of the effects of regulation on the economic efficiency of the tuna industry can be arrived at prior to the development of price demand functions for commodities at the consumer level.

11) Research on North Pacific albacore and bluefin tuna

The Panel learned with interest that the cooperative investigations recommended by Resolution 10 of the WTM have commenced to be implemented through cooperation among the Nankai Regional Fisheries Research Laboratory, and the Biological Laboratories of the U.S. Bureau of Commercial Fisheries in Honolulu and in San Diego, California. It is understood that a Working Group, consisting of representatives of these laboratories, has been established to develop and coordinate the joint research efforts.

The Panel commends the agencies and individuals concerned on their prompt action toward the development of this program and notes that it may be possible through further coordination with other international efforts, under the cognizance of the Intergovernmental Oceanographic Commission (IOC), the Japan-United States Program of Scientific Exchange, and other such arrangements, further to develop cooperative oceanographic research and monitoring of the North Pacific Ocean (as well as other ocean areas) envisaged by the Resolution of the WTM.

12) Oceanography and tuna ecology

The Panel reviewed Resolutions 12 and 13 of the WTM and the documents prepared for its first session. It further took into account information made available at the session by various members of the Panel. In the light of the above information the Panel made the following comments and recommendations in regard to studies of the oceanographic climate and its inter-action with tunas and other organisms related to the tunas.

Large scale studies

The importance of obtaining adequate information on tuna ecology from large oceanwide studies now in progress such as the International Indian Ocean Expedition cannot be exaggerated.

The chairman is requested, in consultation with FAO, to form a Working Group, which, by correspondence, should develop a list of those observations relevant to tuna ecology studies which need to be recommended for inclusion in international oceanographic expeditions and other large area investigations. The chairman was requested to transmit these recommendations to FAO, UNESCO (IOC), WMO and other interested bodies.

It was recognized that important data of interest to the study of tuna oceanography and ecology is available from current international oceanographic expeditions. The Panel strongly recommended that FAO, UNESCO and WMO provide support for scientists now located in various institutions, who desire to undertake and complete the preparation of atlases, charts, and other summary materials.

In regard to the General Scientific Framework for World Ocean Study (GSF) of SCOR, the Panel noted the development of this programme with great interest and requested that appropriate consideration be given to tuna oceanography and ecology problems in regard to the preparation of the GSF.

Regional studies

The Panel stressed the importance of regional studies of the relationship between tuna and their environment which give attention to both the biological environment and to the nature of the oceanographic climate. Such studies as those previously carried out on forecasting the abundance of skipjack tuna in Hawaii and forecasting the abundance of albacore along the west coast of North America, which have as their important elements studies of the oceanographic climate, should be strongly supported.

The Panel also called attention to those studies on the oceanographic climate which focus their attention on rates of change of properties which are now being carried out in pilot form at the Honolulu Biological Laboratory, (Trade Wind Zone Oceanography, TWZO), and contemplated for the Eastern Tropical Pacific (EASTROPAC).

Such studies are of great importance to the association of tunas with physical oceanographic properties because of the importance given to studies of rates of change of properties. Because these factors appear to be related to tuna migrations and abundance in some localities, the Panel believed that such studies are of great importance and recommended that funds from national agencies of the Governments concerned be made available for their adequate support.

Special problems

The Panel identified a variety of problems which need to receive additional attention.

Studies of the thickness of the mixed layer and the temperature gradient in the underlying thermocline in relation to the associated distribution of organisms are required.

There is a definite need to develop and improve both equipment and techniques for such studies below the surface.

There is need for development of means for rapid synoptic mapping of near-surface properties.

Underwater sound, underwater television and other devices for the study of the distribution and abundance of tuna and tuna related animals such as those of the "deep scattering layer", and other plants and animals, need to be developed and used at much greater levels of sophistication.

The Panel believed that rapid progress might be made on research in zones near the maximum limits of the distribution of the species because the influence of the changing gradients on the distribution of the tuna may well be easier to interpret in such zones.

In this regard, the Panel identified some zones in which valuable studies on the relation of tuna occurrence to changing oceanographic conditions should be carried out when practicable in addition to the investigation of the Trade Wind Zone and EASTROPAC already identified.

i) Norwegian coast, the study of Thunnus thynnus;
ii) Alboran Sea, Bay of Spain, Straits of the Canaries-Sahara, the study of Thunnus thynnus;
iii) Madeira and the Azores, the study of Thunnus albacares and Thunnus obesus;
iv) Cap Vert and the Islands of Cap Vert, the study of Thunnus albacares and Thunnus obesus;
v) The Tyrrenian Sea, the study of Thunnus alalunga;
vi) The region between the Gulf Stream and the North American Coast (from Cape Hatteras to the Grand Bank), the study of several species, Thunnus thynnus in particular; this in the framework of the oceanographic surveys now being carried out in the area by the United States.
vii) The Brazilian coast, the study of Thunnus alalunga in deeper waters;
viii) The northern opening of the Canal of Mozambique, the study of Thunnus albacares;
ix) The area from the Coral Sea to the Tasmanian Sea, the study of Thunnus maccoyii, Thunnus albacares and Thunnus alalunga;

x) Waters off Peru and North Chile, the study of Sarda chilensis on one hand, Euthynnus pelamis, Thunnus albacares and Thunnus alalunga on the other. This is in the framework of the current Special Fund projects being carried out in Ecuador, Peru and Chile.

xi) South Africa, in view of its importance as an area of juncture between two oceans, in the region of the Cape of Good Hope.

13) Behaviour

The Panel called attention to the need for specific recommendations in regard to Resolution 13 of the WTM.

The Panel identified the need for studies at sea of feeding behaviour, vertical distribution, three dimensional distribution of tuna schools, as well as the need for well designed comparative studies on the behaviour of different species. Technical improvements in underwater sound equipment for measuring abundance and kinds of marine organisms are required. The Panel recommended that the development of such equipment be given high priority. The use of sonic tags for tracking individual tuna is also a possibly promising area of development.

There is definite need for greater precision in the ability to study the reactions of tuna to a variety of kinds of tuna gear. Technical approaches to this problem should be encouraged and when conducted should be given adequate support.

The study of tuna in captivity is now being carried out in several large aquaria such as those located at the Honolulu Biological Laboratory as well as in various nets, basins, traps and occasionally in bait wells of tuna vessels.

The Panel recognized the need for more and improved facilities.

Studies of the reaction of tuna in captivity to bubble curtains, electric fields, and studies of the sensory perception of tuna to light, shape, sound, low frequency vibration, etc. give considerable promise of yielding useful information and the Panel recommended that FAO contact the various laboratories now working in this field to identify the nature of this work and communicate the information to interested parties for the purpose of stimulating information exchanges between laboratories.

The Panel was aware that there is a critical need for very large aquarium (oceanarium) facilities in a few selected locations. The Panel requested FAO to compile a list of facilities of this kind now in existence, (including facilities constructed only for research purposes and also such facilities as public and private exhibit oceanaria which may be used in part for research), and identify by a questionnaire the nature and extent of facilities available for research, including the availability of space and facilities for visiting scientists. The Panel also strongly recommended that FAO attempt to contact organizations and groups which plan large oceanarium facilities and assist them in

exchanging information. When possible, plans for such facilities which do not include provisions for carrying out tuna related research should be brought to the attention of the Panel chairman in order that the Panel may suggest alternative approaches.

14) Population behaviour and dynamics

The Panel considered recent progress in development and application of theory respecting the dynamics of exploited tuna populations relative to Resolution 22 of the WTM and the report of its Sections 3 and 7. The Panel concluded that development of theoretical models is proceeding as rapidly (if not more so) as the kind and quality of the data for their application permits.

What is now needed is more extensive and more accurate data respecting total catch, catch and effort, size composition, population structure, and migrations of various tuna stocks, as described in more detail in other sections of this report. Only when such data are available can existing theory be applied to many of the exploited tuna populations, or can there be a firm basis for more detailed elaboration of theory. The Panel urged laboratory directors and other authorities to give high priority in their programming to the collection of these urgently needed data.

IV REMAINDER OF AGENDA

1) Date and place of second session

The Panel took note of and endorsed the tentative invitation made by Dr. H. Nakamura to hold its Second Session in Tokyo in March 1966, immediately before a Symposium on Tuna Fisheries to be held at the beginning of April 1966 by the Japanese Society of Fisheries Scientists, and requested FAO to make the necessary official arrangements with the Government of Japan.

2) Panel membership

The Panel expressed the opinion that adequate geographic and subject representation should be maintained among its members, and accordingly, suggested that one more additional tuna scientist from Japan should be invited to membership by FAO. The geographic representation should be completed by one member from a Latin American country, to be invited to membership by FAO.

3) Officers between sessions

The Panel unanimously re-elected for the period between the first and second sessions the officers who served during the First Session: Dr. M. B. Schaefer as Chairman; Dr. H. Nakamura as Vice-Chairman.

ANNEX I

I PARTICIPANTS

1) Members of the Panel

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1/ Dr. Nicholls did not attend the first Session of the Panel
2/ Dr. Sprague replaced Mr. J.C. Marr during the first Session of the Panel

2) Observers of ACMRR

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II OFFICERS OF THE MEETING

Chairman	M.B. Schaefer (U.S.A.)
Vice-Chairman	H. Nakamura (Japan)
Rapporteurs	L.M. Sprague (U.S.A.) E.N.C. Eziuzo (Nigeria)
Technical Secretary	Horacio Rosa, Jr.
Administrative Secretary	Rhoda Capparucci
Assistants	Maureen Dodds Erminia Ronchetti

ANNEX 2

LIST OF PAPERS

1) Working Papers

EPFTR/1/WP.1	Provisional Agenda
2 Rev.1	Program
3	Proposed Program of Work for Working Group VII - Exchange of Scientists
4	Proposed Program of Work for Working Group II - Tagging, Statistics and Selectivity
5	Proposed Program of work for Working Group III - Eggs, Larvae, Juveniles
6	Proposed Program of Work for Working Group V - Tuna Oceanography
7	Proposed Program of Work for Working Group I - Taxonomy and Subpopulations
8	Proposed Program of Work for Working Group VI - Tuna Behavior
9	Proposed Program of Work for Working Group IV - North Pacific Albacore and Bluefin
10	List of Working Papers
11	List of Information Papers
12	Note on Taxonomy of Tunas
13	Definition of Tuna Populations in the Indian Ocean
14	Draft Report
15	Statistical survey report on tuna longline fisheries by fishing grounds, April-September 1962
16	Maps of hooking rate of yellowfin tuna and albacore for the months of February, May, August and November

2) Information Papers

EPFTR/1/IP.1	Information for Participants
2	(1) Terms of Reference - Composition and Procedures (2) List of Members (3) Working Groups
EPFTR/1/IP.3	Proceedings of the World Scientific Meeting on the Biology of Tunas and Related Species - Volume I - Report Actes de la Réunion Scientifique Mondiale sur la Biologie du Thon et des Espèces Voisines - Volume I - Rapport Actas de la Reunión Científica Mundial sobre Biología del Atun y Especies Afines - Volume I - Informe
EPFTR/1/IP.4	Advisory Committee on Marine Resources Research - First Session - Report Comité Consultatif de la Recherche sur les Ressources de la Mer - Première Session - Rapport Comité Asesor sobre Investigaciones de los Recursos Marinos - Primera Reunión - Informe

EPFTR/1/IP.5	Advisory Committee on Marine Resources Research - Second Session - Recommendations
EPFTR/1/IP.6	FAO Working Party for Rational Utilization of Tuna Resources in the Atlantic Ocean - First Session - Report Groupe de Travail FAO sur l'Utilisation Rationnelle des Ressources Thonières de l'Océan Atlantique - Première Session - Rapport Groupo de Trabajo de la FAO sobre Aprovechamiento Racional de los Recursos Atuneros del Océano Atlántico - Primer período de Sesiones - Informe
EPFTR/1/IP.7	Bulletin of Fishery Statistics Bulletin Statistique des Pêches Boletín Estadístico de Pesca
EPFTR/1/IP.8	Proposals for a Standard International Statistical Classification of Fishing Areas
EPFTR/1/IP.9	Notes for the Completion of Form Stana IE